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LOCATION-BASED CONTENT DELIVERY

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LOCATION-BASED CONTENT DELIVERYField of the Invention

5 The present invention relates to delivering content to a mobile terminal, and in particular, to delivering content based on a relative location between the mobile terminal and a location for the content provider.

10 Background of the Invention

Mobile terminals, such as mobile telephones and wireless personal digital assistants (PDAs), are now capable of receiving content from various types of network devices and presenting the content to users in a visual or audible format. Users of these devices may browse the Internet and receive various types of content. Further, mobile terminals may cooperate with various network services to receive notifications relating to any type of event or information.

20 Advertisers and other entities are trying to take advantage of this communication medium by sending users content via their mobile terminals. Users are interested in obtaining this information, but are primarily interested in obtaining information that is deemed beneficial. Similarly, content providers, such as advertisers, want to target users most likely to respond to content delivery.

Existing systems using location-based advertising typically break an area into geographic sectors and send notifications when a mobile terminal is within the sector regardless of proximity to a particular point of presence for a content provider. Figure 1 illustrates a typical configuration wherein A1, A2, and A3 are points of presence for advertisers and West1, West2, East1, and

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East2 are predefined sectors. Mobile terminal users in one sector will only receive advertisements from an advertiser in the same sector, regardless of the actual proximity between the mobile terminal 16 and the points of presence.

In many cases, the mobile terminal 16 may be in one sector, but may be closer to an advertiser's point of presence in other sectors. As illustrated, the mobile terminal 16 is closer to advertiser point of presence A3 than advertiser point of presence A1; however, the location of the mobile terminal 16 in EAST2 limits receipt of advertisers from entities in WEST1, such as advertiser A3. Thus, the mobile terminal 16 will receive advertisements from advertiser A1 instead of the more proximate advertiser A3. Neither the user nor the advertiser can control the sector definitions or base content delivery on relative proximity. Accordingly, there is a need for a technique to provide location-based information to mobile terminals in a more effective and user-friendly manner.

Summary of the Invention

The present invention facilitates content delivery to a mobile terminal based on the proximity of the mobile terminal to a point of presence associated with a content provider. An application service may identify the location of the mobile terminal and use a locality database or service to determine localities containing the identified location. Based on the localities corresponding to the mobile terminal's location, content is selected and delivered to the mobile terminal. The localities may define any geographic region or area associated with a point of presence. For example, a locality may define a business district for a city, the

city, or a defined area about a point of presence. For the latter, a locality could be defined to include an area having a certain radius about a retailer's point of presence or within a certain number of city blocks.

5 One or more profiles may be used to further filter the content delivered to the mobile terminal. Mobile terminal users may create profiles to identify the content or type of content to receive. The profiles may also define zones of acceptance that are static or move
10 with the mobile terminal. Location information may be used to create a zone of acceptance according to profile criteria. The zone of acceptance may then be used to compare with defined localities. Similarly, service providers may create profiles identifying the type of
15 users to receive select content. The service may use any relevant profiles in selecting appropriate content for delivery.

Those skilled in the art will appreciate the scope of the present invention and realize additional aspects thereof after reading the following detailed description of the preferred embodiments in association with the accompanying drawing figures.
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Brief Description of the Drawing Figures

25 The accompanying drawing figures incorporated in and forming a part of this specification illustrate several aspects of the invention, and together with the description serve to explain the principles of the invention.

30 FIGURE 1 is a representative map of typical location sectors defined according to the prior art.

FIGURE 2 is a block representation of a communication environment according to one embodiment of the present invention.

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FIGURE 8 is a block representation of a locality server/database constructed according to one embodiment of the present invention.

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An exemplary communication environment is illustrated in Figure 2. A wireless communication network 10 providing circuit-switched communications is

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The mobile positioning center 26 represents any number of devices capable of determining or gathering location information for the mobile terminal 16 directly or indirectly through a location service 28, the wireless communication network 10, or the like. For example, if the mobile terminal 16 is equipped to determine and provide global positioning system (GPS) coordinates, the mobile positioning center 26 may access the GPS coordinates directly or through the location service 28. The wireless communication network 10 may also include equipment capable of providing enhanced observed time differentiation (E-OTD) or time distance of arrival

An exemplary process flow for one embodiment of the present invention is shown in Figure 3. The process begins (step 100) by identifying an active mobile terminal 16 participating in the content delivery service (step 102). Next, the location of the mobile terminal 16 is determined (step 104). The application server 20 may access the location of the mobile terminal 16 from the mobile positioning center 26, which can determine the

location of the mobile terminal from the wireless communication network 10 or independent location service 28. The location of the mobile terminal 16 may be determined from any capable service as well as from the mobile terminal 16 itself.

Upon accessing the mobile terminal's 16 location, which is typically provided using coordinates such as latitude and longitude, the application server 20 will request a locality or group of localities corresponding to the mobile terminal's 16 location (step 106). For example, the latitude and longitude corresponding to the mobile terminal's 16 location provided by the mobile positioning center 26 is sent to the locality server/database 24 to identify localities encompassing the location. Please note that "encompass" is used to include locations within a locality as well as those within an acceptable proximity of the location, if so desired. The localities are returned to the application server 20, which will use the returned localities and profile information to create and send a query to the content server 22 identifying content to deliver to the mobile terminal 16 (step 108).

The content server 22 will process the query and return content matching the locality and profile criteria. The application server 20 will receive any content matching the locality and profile criteria (step 110) and notify the user that content is available by delivering a notification to the mobile terminal 16 indicating that content is available (step 112). The mobile terminal 16 may present the notification to the user and return a response from the user to the application server 20 indicating whether the user wants to view, ignore, or save the content (step 114). The application server 20 will take the appropriate action

Figure 1 consists of 11 sub-graphs, labeled a) through k), each showing the percentage of total protein in a specific cellular fraction over a 120-minute period. The fractions are: a) Total protein, b) Cytosol, c) Mitochondria, d) Golgi apparatus, e) Lysosomes, f) Peroxisomes, g) Endoplasmic reticulum, h) Plasma membrane, i) Nuclear envelope, j) Nucleolus, and k) Nucleus. Three experimental conditions are compared: Control (solid line), Cycloheximide (dashed line), and Cycloheximide + Cyclosporin A (dotted line). In all fractions, the control group maintains a high percentage of total protein (around 80-90%). The cycloheximide group shows a rapid and significant decrease in protein levels, reaching near-zero values by 120 minutes in most fractions. The cyclosporin A group shows a more gradual decrease, with protein levels remaining above 50% in most fractions at 120 minutes. The combination of cycloheximide and cyclosporin A results in a faster decrease in protein levels than cyclosporin A alone, but it is still slower than the cycloheximide-only group.

5 As noted, profiles may be created for the mobile
terminal 16 user and the point of presence (or content
provider). With a user-based profile, the current
location for a mobile terminal 16 may be converted into a
zone of acceptance, which is compared with the localities
10 defined in the locality server/database 24. Preferably,
the zone of acceptance is determined based on location
information using a spatial database implemented by the
locality server/database 24, but those skilled in the art
will recognize that other devices such as the application
15 server 20 could perform such tasks. The zone of
acceptance may be defined in a mobile terminal 16 user's
profile and may be static or dynamic based on location.
For example, the zone of acceptance may be configured to
limit its scope if obstacles such as a body of water
20 would render proximity information less meaningful.

With reference to Figure 4A, the circle about mobile terminal 16 represents a zone of acceptance defined by the mobile terminal 16 user in a user profile. The zone of acceptance is centered on the current position of the mobile terminal and includes an advertiser point of presence A3. The application server 20 will determine whether the advertiser point of presence A3 is in the zone of acceptance for the mobile terminal 16. The zone of acceptance may be defined as a circular boundary, but may be represented by any geometry, as well as one or more localities. As noted, a zone of acceptance may change as the user moves. Based on profile information, the locality server/database 24 may use the current

Parameter	Value	Unit
Temperature	25.0	°C
Pressure	1.0	atm
Flow rate	1.0	L/min
Concentration	0.1	mol/L
pH	7.0	
Wavelength	254	nm
Scan rate	1.0	nm/min
Integration time	1.0	s
Resolution	0.5	nm
Detector	Photodiode array	
Injection volume	10	μL
Column	C18	
Mobile phase	Water/Acetonitrile	
Gradient	0-100% ACN in 10 min	
Flow rate	1.0	mL/min
Temperature	30.0	°C
Wavelength	254	nm
Scan rate	1.0	nm/min
Integration time	1.0	s
Resolution	0.5	nm
Detector	Photodiode array	
Injection volume	10	μL
Column	C18	
Mobile phase	Water/Acetonitrile	
Gradient	0-100% ACN in 10 min	
Flow rate	1.0	mL/min
Temperature	30.0	°C
Wavelength	254	nm
Scan rate	1.0	nm/min
Integration time	1.0	s
Resolution	0.5	nm
Detector	Photodiode array	
Injection volume	10	μL
Column	C18	
Mobile phase	Water/Acetonitrile	
Gradient	0-100% ACN in 10 min	
Flow rate	1.0	mL/min
Temperature	30.0	°C
Wavelength	254	nm
Scan rate	1.0	nm/min
Integration time	1.0	s
Resolution	0.5	nm
Detector	Photodiode array	
Injection volume	10	μL
Column	C18	
Mobile phase	Water/Acetonitrile	
Gradient	0-100% ACN in 10 min	
Flow rate	1.0	mL/min
Temperature	30.0	°C
Wavelength	254	nm
Scan rate	1.0	nm/min
Integration time	1.0	s
Resolution	0.5	nm
Detector	Photodiode array	
Injection volume	10	μL
Column	C18	
Mobile phase	Water/Acetonitrile	
Gradient	0-100% ACN in 10 min	
Flow rate	1.0	mL/min
Temperature	30.0	°C
Wavelength	254	nm
Scan rate	1.0	nm/min
Integration time	1.0	s
Resolution	0.5	nm
Detector	Photodiode array	
Injection volume	10	μL
Column	C18	
Mobile phase	Water/Acetonitrile	
Gradient	0-100% ACN in 10 min	
Flow rate	1.0	mL/min
Temperature	30.0	°C
Wavelength	254	nm
Scan rate	1.0	nm/min
Integration time	1.0	s
Resolution	0.5	nm
Detector	Photodiode array	
Injection volume	10	μL
Column	C18	
Mobile phase	Water/Acetonitrile	
Gradient	0-100% ACN in 10 min	
Flow rate	1.0	mL/min
Temperature	30.0	°C
Wavelength	254	nm
Scan rate	1.0	nm/min
Integration time	1.0	s
Resolution	0.5	nm
Detector	Photodiode array	
Injection volume	10	μL
Column	C18	
Mobile phase	Water/Acetonitrile	
Gradient	0-100% ACN in 10 min	
Flow rate	1.0	mL/min
Temperature	30.0	°C
Wavelength	254	nm
Scan rate	1.0	nm/min
Integration time	1.0	s
Resolution	0.5	nm
Detector	Photodiode array	
Injection volume	10	μL
Column	C18	
Mobile phase	Water/Acetonitrile	
Gradient	0-100% ACN in 10 min	
Flow rate	1.0	mL/min
Temperature	30.0	°C
Wavelength	254	nm
Scan rate	1.0	nm/min
Integration time	1.0	s
Resolution	0.5	nm
Detector	Photodiode array	
Injection volume	10	μL
Column	C18	
Mobile phase	Water/Acetonitrile	
Gradient	0-100% ACN in 10 min	
Flow rate	1.0	mL/min
Temperature	30.0	°C
Wavelength	254	nm
Scan rate	1.0	nm/min
Integration time	1.0	s
Resolution	0.5	nm
Detector	Photodiode array	
Injection volume	10	μL
Column	C18	
Mobile phase	Water/Acetonitrile	
Gradient	0-100% ACN in 10 min	
Flow rate	1.0	mL/min
Temperature	30.0	°C
Wavelength	254	nm
Scan rate	1.0	nm/min
Integration time	1.0	s
Resolution	0.5	

Points of presence may define one or more associated localities. As shown in Figure 4B, the point of presence for advertiser A1 is associated with concentric localities centered about the point of presence. The solid lined circle represents a first locality, and the dashed line circle represents the second locality. The smaller locality may be further associated with users having a casual desire for goods or services wherein the larger locality may be associated with users having a stronger desire for the goods or services. The latter group is potentially willing to travel further in response to advertising or marketing content.

Advertiser points of presence A2 and A3 have different sized, but overlapping localities. As such, advertiser A2 desires a smaller locality about its point of presence than advertiser A3. If each were advertising similar goods and services, a mobile terminal 16 located in the overlapping region of these localities could receive content from both advertisers A2 and A3. However, the user's profile may have a zone of acceptance limitation that would include advertiser A2,

but not advertiser A3. Thus, the user profile may trump an advertiser's profile and vice versa.

Multiple content providers having approximately the same locations, such as retailers in a shopping mall or shopping district, may be associated with one another and provide common localities, and perhaps provide common content. As illustrated in Figure 4C, advertiser points of presence A3 through A6 may be clustered together to form one or more localities. Profiles may associate larger localities with certain of the advertisers and smaller localities with other advertisers.

The application server 20 or the locality server/database 24 may be configured to expand localities or zones of acceptance, when no content is found for a mobile terminal's 16 current location or zone of acceptance, or when an insufficient number of mobile terminals 16 are found within a point of presence's locality. The application server 20 may request another layer of surrounding localities to expand the previously-determined area of interest for either the mobile terminal 16 or point of presence.

Notably, the localities may be used when recognizable geographic locations are deemed beneficial for content providers to define locations. Alternatively, the localities, as well as zones of acceptance, may be mathematically defined, such as a circular area having a radius of five miles and centered on a point of presence. Although circular localities are depicted, localities and zones of acceptance may take on any shape deemed appropriate for the content to deliver and the recipients thereof.

Figures 5A through 5D provide a representative communication flow for an exemplary embodiment of the present invention. Initially, the mobile terminal 16 may

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provide user profile information back to the application server 20 (step 220).

5 The application server 20 will next request current location information from the mobile positioning center 26 (or other location service) using the mobile terminal's 16 ID (step 222). The current location information is returned, typically using latitude and longitude coordinates, to the application server (step 224), which will request a locality list based on the
10 returned location from the locality server/database 24 (step 226). The locality list for the location is returned and processed by the application server 20 based on any available user and content provider profiles (step 228).

15 A content request is created using relevant profile information and localities. The application server 20 will send the request for the content to the content server 22 (step 230), which will respond by providing the content to the application server 20 (step 232). Upon
20 receipt of the content, the application server 20 will send a content notification event to the wireless portal 14 indicating content is available (step 234). The wireless portal 14 will send a corresponding notification to the mobile terminal 16 via the wireless communication
25 network 10 (step 236). Concurrently, the application server 20 may temporarily store the content in the application database 30 (steps 238 and 240).

As described above, the mobile terminal 16 may respond by sending instructions to view, ignore or save
30 the content for subsequent retrieval. To send a response to retrieve content, the mobile terminal 16 may initiate a corresponding operation by sending an operation ("get content") to the wireless portal 14 (step 242), which will access information regarding the current session

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with the mobile terminal 16 (steps 244 and 246). After confirming authorization, the wireless portal 14 may send an operation ("get content") request to the application server 20 (step 248), which will access the content to deliver the mobile terminal 16 from the application database 30 (steps 250 and 252).

The application server 20 may be configured to send a summary for the content to mobile terminal 16 via the wireless portal 14 in response to the operation ("get content") (steps 254 and 256). The mobile terminal 16 will initiate another operation based on how the content should be processed. If the user elects to view the content, the mobile terminal 16 may initiate a corresponding operation by sending an operation ("view") to the wireless portal 14 (step 258), which will access information regarding the current session with the mobile terminal 16 (steps 260 and 262). After confirming authorization, the wireless portal 14 may send an operation ("view") request to the application server 20 (step 264), which will deliver the content to the mobile terminal 16 via the wireless portal 14 (steps 266 and 268).

If the user elected to ignore the content, the mobile terminal 16 may initiate a corresponding operation by sending an operation ("ignore") to the wireless portal 14 (step 270), which will access information regarding the current session with the mobile terminal 16 (steps 272 and 274). After confirming authorization, the wireless portal 14 may send an operation ("ignore") request to the application server 20 (step 276), which may send a corresponding message to the content server 22 (step 278). The content server 22 may process the information indicating the content was ignored and acknowledge receipt of the message (step 280). The

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occurrence of any defined event, such as entering a new cell or receiving, initiating or ending a call.

Content requests may also be generated independent of the mobile terminal. For example, the requests may be triggered by a daemon running on the application server 20, which monitors users participating in the content service and the location of the users' mobile terminals 16. The daemon will trigger a request for content based on location and in light of any defined profiles. As an example, the daemon may poll mobile terminal locations for all participating users via the mobile positioning server 26. As such, the daemon's poll algorithm would replace the above steps 200-240 wherein steps 200-214 would not be necessary since the daemon runs on the application server and requires no authentication. Step 236 (send notification) could be an SMS message to the user indicating content is available, and the user would, at some subsequent time, retrieve the content starting with step 242.

The polling algorithm for the daemon would essentially identify location-based information for the mobile terminal 16 and trigger content according to any number of scenarios. For example, the polling algorithm may identify changes in location or remaining in one location for a long time, which could be defined by service-level profiles such as ten poll times or a defined period of time. The polling algorithm could also detect direction and relative or current velocity to help determine when and if to provide content.

The location monitoring of the server application 20 may be combined with or work in association with the requests initiated by the user or by the mobile terminal 16 itself. As such, users can elect when and if they want the system to track their locations and still access

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content as desired regardless of tracking. Those skilled in the art will recognize numerous variants on these themes that are considered within the scope of this disclosure. Although the mobile terminal 16 may take on many configurations, an exemplary mobile terminal 16 is represented in Figure 6. The mobile terminal 16 may include a receiver front end 36, a radio frequency transmitter section 38, an antenna 40, a duplexer or switch 42, a baseband processor 44, a system controller 46, a frequency synthesizer 48, and an interface 50. The receiver front end 36 receives information bearing radio frequency signals from one or more remote transmitters provided by the base station 14. A filter circuit 52 minimizes broadband interference in the received signal, while a downconverter 54 downconverts the filtered, received signal to an intermediate or baseband frequency signal, which is then digitized into one or more digital streams. The receiver front end 36 typically uses one or more mixing frequencies generated by the frequency synthesizer 48.

The baseband processor 44 processes the digitized received signal to extract the information or data bits conveyed in the received signal. This processing typically comprises demodulation, decoding, and error correction operations. As such, the baseband processor 44 is generally implemented in one or more digital signal processors (DSPs).

On the transmit side, the baseband processor 44 receives digitized data from the system controller 46, which it encodes for transmission. The encoded data is output to the transmitter 38, where it is used by a modulator 56 to modulate a carrier signal that is at a desired transmit frequency. A power amplifier 58

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5 and interface circuitry 60 associated with a microphone 62, a speaker 64, a keypad 66, and a display 68. The I/O and interface circuitry 60 typically includes analog-to-digital converters, digital-to-analog converters, amplifiers, and the like. Additionally, it may include a voice encoder/decoder, in which case it may communicate directly with the baseband processor 44.

15 indirectly to the baseband processor 44. Audio
information encoded in the received signal is recovered
by the baseband processor 44, and converted into an
analog signal suitable for driving speaker 64 via the I/O
and interface circuitry 60. The keypad 66 and display 68
20 enable the user to interact with the mobile terminal 16,
for example input numbers to be dialed, address book
information, or the like, as well as monitor call
progress information.

display 68 may be used for more data-intensive applications, such as providing messages and information using the short messaging service (SMS), paging, email, and the like. Messages may be sent to the mobile terminal 16 to indicate that content is available for viewing, describe available content, or provide any information related to accessing, providing, and displaying content according to the present invention.

In one embodiment, the display 68 and keypad 66 cooperate to provide soft-key functions wherein icons

displayed on the display 68 are presented to the user and may be selected upon pressing an associated key. The icons may represent available content and trigger display of the content when pressed. Additionally, icons may be
5 provided to give the user options to request, view, ignore, and save content.

As shown in Figure 7, the application server 20 may be a typical web server having a central processing unit (CPU) 70 with the requisite memory 72 containing the
10 software 74 and data necessary for operation. The CPU 70 is associated with a network interface 76 facilitating communications with other devices, such as the wireless portal 14, mobile positioning center 26, content server 22, online backup database 32, locality server/database
15 24, wireless portal database 34, and application database 30, on the packet-switched network 12 through any number of local area networks, routers, switches and hubs in traditional fashion.

As shown in Figure 8, the locality server/database
20 24 may be a typical web server having a central processing unit CPU 78 with the requisite memory 80 containing the software 82 and data necessary for operation. The CPU 78 will preferably implement a spatial database capable of providing the operation
25 described above. The CPU 78 is also associated with a network interface 84 facilitating communications with other devices, such as the application server 20, mobile positioning center 26, content server 22, online backup database 32, locality server/database 24, wireless portal
30 database 34, and application database 30, on the packet-switched network 12 through any number of local area networks, routers, switches and hubs in traditional fashion.

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Those skilled in the art will recognize improvements and modifications to the preferred embodiments of the present invention. All such improvements and modifications are considered within the scope of the

5 concepts disclosed herein and the claims that follow.

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